Amendments to the Claims

Please amend Claims 20, 40, 43, and 45. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

What is claimed is:

1. (Previously Presented) An apparatus for determining changes in the shape of an object comprising:

an electromagnetic radiation source coupled to the object, the electromagnetic radiation source emitting a cross-shaped cross-section beam,

an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, responses of the sensors indicating angular orientation of the shaped beam with respect to the array,

a processor processing the responses of the sensors to determine a twist of the object.

2. (Previously Presented) The apparatus of Claim 1 wherein the responses of the sensors indicate a displacement of the cross-shaped cross-section beam with respect to the array.

3. (Canceled)

4. (Original) The apparatus of Claim 1 wherein the electromagnetic radiation source is a laser.

5. (Original) The apparatus of Claim 1 wherein the electromagnetic radiation source is an electromagnetic-radiation-emitting diode.

6. (Original) The apparatus of Claim 1 wherein the electromagnetic radiation source comprises at least two electromagnetic radiation sources.

7. (Previously Presented) The apparatus of Claim 1 wherein the processor further processing the responses of the sensors to determine bend of the object.

8. (Original) The apparatus of Claim 1 wherein the array of electromagnetic radiation sensors is non-linear.

9. (Original) The apparatus of Claim 1 further comprising an electromagnetic radiation focusing device positioned between the electromagnetic radiation source and the array of electromagnetic radiation sensors.

10. (Original) The apparatus of Claim 1 wherein the electromagnetic radiation is infrared, visible, or ultraviolet light.

11. (Original) The apparatus of Claim 1 wherein the object is a blade.

12. (Previously Presented) The apparatus of Claim 1 further comprising

a second electromagnetic radiation source coupled to the object, the second electromagnetic radiation source emitting a second cross-shaped cross-section beam, and

a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, responses of the sensors of the second array indicating orientation of the second cross-shaped cross-section beam with respect to the second array.

13. (Original) The apparatus of Claim 12 wherein the object is a blade.

14. (Previously Presented) The apparatus of Claim 12 wherein the first cross-shaped cross-section beam and the second cross-shaped cross-section beam are substantially co-directed.

15. (Previously Presented) The apparatus of Claim 12 wherein the first cross-shaped cross-section beam and the second cross-shaped cross-section beam are substantially counter-directed.

16. (Original) The apparatus of Claim 1 wherein the changes in shape of the object are indicative of flow of a fluid around the object.

17. (Previously Presented) An apparatus for determining changes in the shape of an object comprising

a first electromagnetic radiation source coupled to the object, the first electromagnetic radiation source emitting a first cross-shaped cross-section beam,

a first array of electromagnetic radiation sensors coupled to the object to receive radiation from the first radiation source, responses of the sensors of the first array indicating angular orientation of the first beam with respect to the first array,

a second electromagnetic radiation source coupled to the object, the second electromagnetic radiation source emitting a second cross-shaped cross-section beam,

a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, responses of the sensors of the second array indicating angular orientation of the second cross-shaped cross-section beam with respect to the second array;

the second radiation source being axially displaced along a length of the object with respect to the first radiation source and the second array of sensors being axially displaced along a length of the object with respect to the first array of sensors to provide a combined indication of changes in the shape of the object, and

a processor processing the responses of the first and the second array of sensors to determine a twist of the object.

18. (Original) The apparatus of Claim 17 wherein the object is a blade.

19. (Original) The apparatus of Claim 17 wherein the first beam and the second beam are substantially counter-directed.

20. (Currently Amended) A blade comprising

an electromagnetic radiation source ~~coupled~~ fixed to the blade, the electromagnetic radiation source emitting a beam, and

an array of electromagnetic radiation sensors ~~coupled~~ fixed to the blade to receive radiation from the radiation source, responses of the sensors indicating orientation of the beam with respect to the array, the orientation indicating bending of the blade.

21. (Previously Presented) A method for determining changes in the shape of an object comprising:

emitting a cross-shaped cross-section beam from an electromagnetic radiation source coupled to the object,

determining angular orientation, representing twist of the object, of the cross-shaped cross-section beam with respect to an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, using responses of the sensors; and

providing data indicative of the angular orientation of the object.

22. (Previously Presented) The method of Claim 21 further comprising determining displacement of the cross-shaped cross-section beam with respect to the array using responses of the sensors.

23. (Canceled)

24. (Original) The method of Claim 21 wherein the electromagnetic radiation source is a laser.

25. (Original) The method of Claim 21 wherein the electromagnetic radiation source is an electromagnetic-radiation-emitting diode.

26. (Original) The method of Claim 21 wherein the electromagnetic radiation source comprises at least two electromagnetic radiation sources.

27. (Previously Presented) The method of Claim 21 further comprising processing the responses of the sensors to determine bend.

28. (Original) The method of Claim 21 wherein the array of electromagnetic radiation sensors is non-linear.

29. (Original) The method of Claim 21 further comprising focusing the electromagnetic radiation using a focusing device positioned between the electromagnetic radiation source and the array of electromagnetic radiation sensors.

30. (Original) The method of Claim 21 wherein the electromagnetic radiation is infrared, visible, or ultraviolet light.

31. (Original) The method of Claim 21 wherein the object is a blade.

32. (Previously Presented) The method of Claim 21 further comprising

emitting a second cross-shaped cross-section beam from a second electromagnetic radiation source coupled to the object, and

determining orientation of the second cross-shaped cross-section beam with respect to a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, using responses of the sensors of the second array.

33. (Original) The method of Claim 32 wherein the object is a blade.

34. (Previously Presented) The method of Claim 32 wherein the first cross-shaped cross-section beam and the second cross-shaped cross-section beam are substantially co-directed.

35. (Previously Presented) The method of Claim 32 wherein the first cross-shaped cross-section beam and the second cross-shaped cross-section beam are substantially counter-directed.

36. (Original) The method of Claim 21 wherein the changes in shape of the object are indicative of flow of a fluid around the object.

37. (Previously Presented) A method for determining changes in the shape of an object comprising

emitting a first cross-shaped cross-section beam from a first electromagnetic radiation source coupled to the object,

determining twist of the object from an angular orientation of the first cross-shaped cross-section beam with respect to a first array of electromagnetic radiation

sensors coupled to the object to receive radiation from the first radiation source, using responses of the sensors of the first array,

emitting a second cross-shaped cross-section beam from a second electromagnetic radiation source coupled to the object,

determining twist of the object from an angular orientation of the second cross-shaped cross-section beam with respect to a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, using responses of the sensors of the second array;

the second radiation source being axially displaced along a length of the object with respect to the first radiation source and the second array of sensors being axially displaced along a length of the object with respect to the first array of sensors to provide a combined indication of changes in the shape of the object; and

providing data indicative of the angular orientation of the object.

38. (Previously Presented) The method of Claim 37 wherein the object is a blade.

39. (Previously Presented) The method of Claim 37 wherein the first beam and the second beam are substantially counter-directed.

40. (Currently Amended) A method to determine changes in the shape of a blade comprising

emitting a beam from an electromagnetic radiation source ~~coupled~~ fixed to the blade, determining orientation of the beam with respect to an array of electromagnetic radiation sensors ~~coupled~~ fixed to the blade to receive radiation from the radiation source, using responses of the sensors; and

providing data indicative of the angular orientation of the ~~object~~ beam with respect to the array.

41. (Previously Presented) An apparatus for determining changes in the shape of an object comprising:

a means for emitting a cross-shaped cross-section beam of electromagnetic radiation, the means for emitting electromagnetic radiation being coupled to the object, and

an array of means for sensing electromagnetic radiation, the array being coupled to the object to receive radiation from the means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation indicating orientation of the shaped beam with respect to the array, the orientation representing twist of the object.

42. (Previously Presented) An apparatus for determining changes in the shape of an object comprising:

a first means for emitting a first cross-shaped cross-section beam of electromagnetic radiation, the first means for emitting electromagnetic radiation being coupled to the object,

a first array of means for sensing electromagnetic radiation, the first array being coupled to the object to receive radiation from the first means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation of the first array indicating angular orientation, representing twist of the object, of the first beam with respect to the first array,

a second means for emitting a second cross-shaped cross-section beam of electromagnetic radiation, the second means for emitting electromagnetic radiation being coupled to the object, and

a second array of means for sensing electromagnetic radiation, the second array being coupled to the object to receive radiation from the second means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation of the second array indicating angular orientation, representing twist of the object, of the second beam with respect to the second array;

the second means for emitting a second cross-shaped cross-section beam of electromagnetic radiation being axially displaced along a length of the object with respect to the first means for emitting a first cross-shaped cross-section beam of electromagnetic radiation and the second array of means for sensing electromagnetic radiation being axially displaced along a length of the object with respect to the first array of means for sensing electromagnetic radiation to provide a combined indication of changes in the shape of the object.

43. (Currently Amended) A blade comprising

a means for emitting a beam of electromagnetic radiation, the means for emitting electromagnetic radiation being ~~coupled~~ fixed to the blade, and

an array of means for sensing electromagnetic radiation, the array being ~~coupled~~ fixed to the blade to receive radiation from the means for emitting electromagnetic radiation, responses of the means for sensing electromagnetic radiation indicating orientation of the beam with respect to the array, the orientation indicating bending of the blade.

44. (Original) An apparatus for determining flow of a fluid around an object comprising

an electromagnetic radiation source coupled to the object, the electromagnetic radiation source emitting a beam, and

an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, responses of the sensors indicating orientation of the beam with respect to the array.

45. (Currently Amended) A method for determining flow of a fluid around an object comprising

emitting a beam from an electromagnetic radiation source coupled to the object, determining orientation of the beam with respect to an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, using responses of the sensors; and

providing data indicative of the angular orientation of the ~~object~~ beam with respect to the array.

46. (Original) An apparatus for determining flow of a fluid around an object comprising

a means for emitting a beam of electromagnetic radiation, the means for emitting electromagnetic radiation being coupled to the object, and

an array of means for sensing electromagnetic radiation, the array being coupled to the object to receive radiation from the means for emitting electromagnetic radiation,

responses of the means for sensing electromagnetic radiation indicating orientation of the beam with respect to the array.

47. (Previously Presented) The apparatus of Claim 1 wherein the object is a building.

48. (Previously Presented) The apparatus of Claim 1 wherein the object is a bridge.

49. (Previously Presented) The apparatus of Claim 1 wherein the object is a tower.

50. (Previously Presented) The apparatus of Claim 17 wherein the object is a building.

51. (Previously Presented) The apparatus of Claim 17 wherein the object is a bridge.

52. (Previously Presented) The apparatus of Claim 17 wherein the object is a tower.

53. (Previously Presented) The method of Claim 21 wherein the object is a building.

54. (Previously Presented) The method of Claim 21 wherein the object is a bridge.

55. (Previously Presented) The method of Claim 21 wherein the object is a tower.

56. (Previously Presented) The method of Claim 37 wherein the object is a building.

57. (Previously Presented) The method of Claim 37 wherein the object is a bridge.

58. (Previously Presented) The method of Claim 37 wherein the object is a tower.

59. (Previously Presented) The blade of Claim 20 further comprising a processor to process the responses of the sensors to determine a twist of the blade.

60. (Previously Presented) The blade of Claim 20 further comprising:

a second electromagnetic radiation source coupled to the blade, the second electromagnetic radiation source emitting a second beam, and

a second array of electromagnetic radiation sensors coupled to the blade to receive radiation from the second radiation source, responses of the second array of sensors indicating orientation of the second beam with respect to the second array.

61. (Previously Presented) The blade of Claim 20 wherein the beam is a cross-shaped cross-section beam.

62. (Previously Presented) The method of Claim 40 further comprising processing the responses of the sensors to determine a twist of the blade.

63. (Previously Presented) The method of Claim 40 further comprising:

emitting a second beam from a second electromagnetic radiation source coupled to the blade; and

determining orientation of the second beam with respect to a second array of electromagnetic radiation sensors coupled to the blade using responses of the sensors to the second beam.

64. (Previously Presented) The method of Claim 40 wherein the beam is a cross-shaped cross-section beam.

65. (Previously Presented) An apparatus for determining changes in the shape of an object comprising:

an electromagnetic radiation source coupled to the object, the object being selected from the group consisting of a building, a bridge, and a tower, the electromagnetic radiation source emitting a shaped beam; and

an array of electromagnetic radiation sensors coupled to the object to receive radiation from the radiation source, responses of the sensors indicating angular orientation of the shaped beam with respect to the array.

66. (Previously Presented) The apparatus of Claim 65 further comprising a processor to process the responses of the sensors to determine a twist of the object.

67. (Previously Presented) The apparatus of Claim 65 further comprising:

a second electromagnetic radiation source coupled to the object, the second electromagnetic radiation source emitting a second beam, and

a second array of electromagnetic radiation sensors coupled to the object to receive radiation from the second radiation source, responses of the sensors indicating orientation of the second beam with respect to the second array.

68. (Previously Presented) The apparatus of Claim 65 wherein beam is a cross-shaped cross-section beam.